

# The "TETRAEDR" UE

## 10 Years of Progress

The TETRAEDR Unitary Enterprise (UE) is a scientific and industrial enterprise specializing in development and manufacture of advanced radio-electronic weapon systems, hardware and software used in radar and radio electronic control assets as well as in upgrade of Air Defence Missile Systems.

TETRAEDR set up on 26 April 2001.

Over 350 employees work at TETRAEDR.

Initially TETRAEDR's main direction was development of the "cost-effectiveness" program for upgrading the Soviet S-125 NEVA/PECHORA Air Defence Missile System (ADMS) named PECHORA-2T ADMS. The upgrading program was mainly associated with introduction of two surface-to-air missile (SAM) guidance methods of the in-house design into the operation algorithms of the Soviet ADMS: the first one was the kinematic differential control (KDC) guidance method based on the terminal optimal aircraft control theory; the second one was the modified three point (MTP) guidance method based on the local optimal aircraft control theory.

Implementation of the upgrading program resulted in improving target kill probability with a single missile, extending target destruction zone boundaries, increasing manifold jamming immunity, providing two target channel capacity. The S-125-2T PECHORA-2T ADMS enabled destruction of modern small-size targets and aerial targets flying at a speed of 900 m/s compared to 700 m/s as with the baseline S-125 ADMS. An important advantage of the upgrading program was the fact that the upgrade was carried out in the customers' territory.

Beginning from 2006 TETRAEDR has been offering to foreign customers the project of upgrading the S-125 PECHORA ADMS to the level of the S-125-2TM PECHORA-2TM.

Employment in the S-125-2TM ADMS of the KDC and MTT methods of missile guidance, new principles of radar signal processing, the modern electro-optical system and a number of other developments have resulted in creation of

the upgraded ADMS that meets the up-to-date requirements in terms of combat effectiveness, jamming immunity, survivability, operation reliability and ergonomics.

At present the S-125-2TM PECHORA-2TM upgrade project is being implemented concurrently for several customers.

By the end of 2010 the total number of the live firings conducted by the S-125-2T/2TM ADMS has reached 97.

In 2002 a project of upgrading the OSA-AK ADMS to the OSA-1T ADMS version was initiated by using the developments which were incorporated during upgrade of the S-125 PECHORA ADMS. This enabled a substantial enhancement of the main combat characteristics and made them comparable with those of the modern ADMS like TOR-M1, Crotale-NG or ADATS. The target destruction range of the OSA-1T ADMS increased from 10 up to 12.2 km and the target destruction altitude – from 5 up to 7 km. The upgraded ADMS got an ability to destruct aerial targets flying at a speed of 700 m/s.

Further upgrade of the upgrade project of the OSA-1T ADMS resulted in initiating a new project in 2008 – the T38 STILET ADMS. The T38 STILET ADMS features enhanced combat and performance characteristics as compared with the OSA-1T ADMS and enables employment of both the 9M33M2(3) SAM, produced earlier and the new T382 SAM being developed by TETRAEDR.

Equipment and eight SAMs of the new ADMS are accommodated on a single wheeled chassis – MZKT-69222T carrying a powerful diesel engine, navigation systems, topographic precise positioning assets, survival facilities, communication means and power supply means.

The target destruction range of the T38 STILET ADMS employing the new T382 SAM has increased two-fold as compared with the OSA-AKM ADMS – from 10 up to 20 km and the maximum target destruction altitude has increased from 7 up to 10 km. The new ADMS enables destruction of higher-speed targets flying at a speed of up to 900 m/s



A3 Multipurpose Missile and Gun System

compared to 700 m/s as with the OSA-1T ADMS. The target kill probability is 0.9. The operational lifetime of the new T382 SAM is 25 years.

By the end of 2010 the total number of the live firings conducted by the OSA-1T ADMS has reached 64.

The OSA-1T ADMS is in service with several customers.

Since 2009 the project of upgrading to the level of the OSA-1T ADMS has been closed out due to initiation of the T38 STILET ADMS project.

In October 2010 the first five live firings of the T38 STILET ADMS using the 9M33M3 missiles were conducted at training fire range No.174 of the Air Force and Air Defence of the Ministry of Defence of the Republic of Belarus. All five targets including two fast-moving IVTs-M1 ones were destroyed.

At present the T38 STILET ADMS project is being implemented concurrently for several customers.

The R&D works carried out at our own initiative have resulted in creation of the A3 Multipurpose Missile and Gun System (anti-air, anti-armor, anti-terrorism). The A3 System was exhibited for the first time at the EUROSATORY-2008 Defence Exhibition (Paris, France).

Apart from solving air defence tasks the A3 Multipurpose Missile and Gun System can be employed to fight enemy personnel and ground armoured targets (main battle tanks, infantry fighting vehicles, armored personal carriers) as well as to solve antiterrorist tasks.

The A3 System is fitted with passive optical means for surveillance, tracking of targets and targeting of weapon assets which ensures complete concealment of its combat employment. The A3 System can be operated at any time under any weather conditions and in different climatic zones.

The A3 System comprises combat and technical assets. The combat assets include a command post and combat modules (up to 6 units); the technical means include a transportation-and-loading vehicle and maintenance vehicle.

The A3 System is constructed using the open architecture principle, i.e. it can integrate different



T38 STILET Air Defence Missile System



S-125-2TM PECHORA-2TM Air Defence Missile System

types of anti-aircraft missile, artillery and anti-tank weapons. The controllable rotating platforms, standard data communication channels and multifunctional automated workstations with a special program system constitute the basis of the A3 System. The rotating platforms made on the basis of direct drive motors can accommodate different types of weapons with their targeting

systems which integrate into the common system by using special-purpose computers. The module design of the A3 System enables its mounting on different platforms. The A3 System can be integrated with other mobile or stationary air defence systems which safeguard the state's borders and protect seacoast.

In 2002-2005 TETRAEDR developed fast-moving aerial target simulators IVTs-M1 and IVTs-M2 for live firings from short-range and close-in ADMS. By the order of the Minister of Defence of the Republic of Belarus the IVTs-M1 and IVTs-M2 target simulators were adopted for service with the Air Force and Air Defence in 2002 and 2005 respectively.

Since 2009 TETRAEDR has been upgrading the P-18 Radar to the level of the P-18T/TRS-2D and P-19 to the level of the P-19T/TRS-2DL. The P18-T/TRS-2D Radar meets all the requirements to the up-to-date and advanced radars and can integrate into any Air Defence system including air traffic control systems. All procedures of signal processing, target detection and information retrieval are performed totally automatically (without involvement of men-operators).

TETRAEDR products have been presented more than once at many international exhibitions of arms and military and defense industry: MSPO (Kielce, Republic of Poland), IDEX (Abu-Dhabi, UAI), MILEX (Minsk, Republic of Belarus), EUROSATORY (Paris, France).

TETRAEDR has been awarded with medals and diplomas for achievements in the field of upgrade of armaments and military equipment, diplomas for unique developments in the field of creation of up-to-date armaments and military equipment.



P-18T/TRS-2D Radar



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